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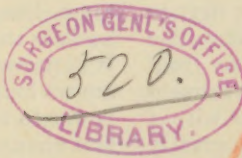




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CELLULAR RADIATION.



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An accident met with recently has induced me to communicate this paper.

In stepping out of a phaeton I struck my left hand against the edge of an iron rod. I had on at the time a pair of heavy kid gloves. The blow made no rent in the glove, but caused an abrasion of the skin on the outside of the hand, about three-quarters of an inch in diameter. For a few hours the wound pained me very much, causing considerable constitutional disturbance. The next morning I was sick with *La Grippe*, but my wound was painless. In the afternoon I noticed a radiation of delicate straight lines surrounding it, extending from one to two inches from the wound, about one-eighth of an inch apart, slightly bulbous at their connection with the wound, and at the periphery of the radiation, so fine that they hardly could be seen. The color of these lines was the same as the skin of the hand, with no appearance of inflammation. The lines were only seen when the hand was in a state of flexion.

I gave the wound no special treatment, but left a layer of blood on it to dry, to exclude it from exposure to the air. The radiation daily diminished in size from the circumference, and had almost disappeared, in about ten days, or rather within the "age of resolution," leaving a greatly diminished size of the wound in form of a scab. When the scab was removed, the cicatrix followed by a dry process, leaving a slight trace of the radiation, and its connecting vascularity.

What is the nature of this radiation, and what is its function? The lines were geometrically straight, and could not be vascular in nature; but evidently were of an intercellular material, developed under fixed laws of its own. The radiation was caused by a traumatic irritant. Although its lines were seen but on the surface, there is no doubt they existed and radiated in the same manner from the wound into the surrounding deep tissues. In the case of a wound deeply imbedded within

the body, as a gun shot wound, such a lineal cellular organization would surround it from all points.

The formative process of these lines is primarily effected by the wound itself. The traumatic irritation caused a contractility of the connective cellular tissue, aiding the migration of the intercellular cells to the raw surface of the wound, where their energy became augmented by a vital affinity with the fibrine exudation from the local congestion. This affinity now established transmitted its vital influence in a direct line to the rear cells, forming the lines in question. The immediate cells thus forced by its own innate power, to the wound pass through a transformation, as it surrenders its blastema to the inflammatory exudation in the formation of granulation. When the granulation, or rather the metamorphosis into exudative cells is about completed, the radiation diminishes, and it is the peripheral portion of the lines that first disappear.

But what becomes of the last issue of these lineal cells, after the wound is healed, and they are no longer in demand? It appears when cells forming these lines are no longer needed, they having not the power to recede into their native locality, are changed into connective cells, they lose their shape, size, color elasticity and power of propagation. It appears here lies the secret, why when any part of the body has been seriously damaged by a wound or by a disease, it has not the same recuperative power it had before; and it even accounts for the predisposition of the same disease that existed once before. As the ultimate locus of life is in the cells (which we know by the primordial cell, and its power of propagation), it is when these are impaired we find the cause of decay in old age, and the remote cause of disease by fault of assimilation and nutrition.

The physiology of cellular radiation, in connection with wounds, has some very

interesting features. Its reciprocal action with the wound itself regulates and builds up the healing process. If the traumatic inflammation is, so to speak, within physiological bounds, we have what we call union by first intention. But when the balance of this reciprocity does not exist, we have ulceration, fungus growth, or even gangrene. The contractility of the connective cellular tissue and the mobility of the intercellular cells gives a prompt response to the irritation of the wound. It appears to be an independent reflex action from the wound itself, and is not connected with any muscular structure, and is even without nerves.

Cellular radiation only assumes a pathological feature when subserving to some existing disease. I have my doubts if it is ever etiological in its primary action. It is on this very point we find Virchow and Rokitsansky's cellular pathology not tenable. Cells not connected with vascularity have no pathology. The former made a significant remark in regard to the individuality of intercellular cells, from which we draw the inference, that they are not etiological of disease, but may be readily destroyed by a high inflammatory action. He says: "Every individual cell may run its own peculiar course, may undergo its own peculiar changes, without the fate of the cell lying next it being necessarily linked with its own." The intercellular cells have a system of their own; in many of their functions they are independent of the connective tissues, and the nervous and vascular systems. They have an intimate relation with the capillary circulation, not by a direct communication, yet still in a way to become the recipient of blastema by endosmosis. It is true that a parent cell may have its anomalous development, but that would not come within the range of our consideration.

Nearly all topical medical treatment has its effect on cellular radiation. For ages local remedies were administered with the view to control nervous and vascular action, when often, in a direct manner, they had but little to do with either.

I will briefly refer to a few cases in my own practice to verify this statement:

1. In amputating a finger, I dipped the stump into the spirits of turpentine before applying the dressing. A healing of the first intention followed. Modern surgery would ascribe this ready healing to the

antiseptic properties of the remedy. This, however, was not the case; for it was the application of turpentine that aroused the energies of the cells, in a way to favor the formative process.

2. In the summer of 1866, I operated on a maiden lady of great obesity, to relieve her of strangulated inguinal hernia. The operation gave her immediate relief; but the depth of the wound, the hot weather, and the plethoric condition of the patient gave me considerable uneasiness as to the prognosis of the case. I closed up both the ring and the external opening with sutures, and as a prophylactic to pyemia and gangrene, kept a compress over the wound saturated with a weak solution of Labarrque's solution. The wound healed rapidly with very little suppuration. Then I could not fully account for the speedy recovery of my patient. It is true I gave credit to the antiseptic treatment and the recuperative powers of nature, but there was an auxiliary that favored the recovery I could not account for, for I remember not a drop of the solution, for obvious reasons, was allowed to enter the wound itself. In my retrospection of the case now, I see how Labarrque's solution stimulated cellular radiation, and no doubt favored the rapid recovery of my patient.

3. In the late war having in charge a hospital, one evening a soldier was brought in with double pneumonia. He labored under great dyspnea, cyanosis, and other unfavorable symptoms. He was put to bed, and I ordered a large compress saturated with spirit of turpentine to be applied to his entire chest, to be left on all night, if the turpentine were tolerated. Next morning the patient was greatly relieved, and with a general treatment that followed he finally recovered. Then I gave all credit to counter-irritation for the happy effects of the case, yet, from my present views of the case, I believe if I had blistered the man, in all probability he would have died that night. I will not stop here to give the differential therapeutic effects of the two irritants. But what did that counter-irritation effect? Was it only forcing a vascular circulation to the surface? Not at all. It transposed the pulmonic irritation to the surface, followed by arousing a full energy of the cellular radiation of the entire chest. As soon as this was effected the *recently* formed

pulmonic hyperæmia was readily overcome. But had the pneumonia been in a more advanced stage, the treatment would not have saved the patient.

When an inflammation sets in, under the storm of a violent vascular action, followed with rapid infiltration, the cellular radiation immediately follows to resist (rather to repair) the morbid action; but where the inflammatory action is so much greater than the cellular resistance the latter rather increases than diminishes the inflammatory force; therefore, it may appear to become a pathological element in the disease. This question throws some light on the subject of the administration of antipyretics with good effects.

Cellular radiation as a physiological factor in the animal economy resists all diseases; but when it fails to overcome a morbid resistance it may be the means of doing great harm. It is thus in syphilis, cancer and infectious miasm it disseminates the seed of the disease throughout the body. This explains why irritating topical applications to cancerous growth, may cause cachexia, and shorten the life of the patient. Therefore to take advantage of this cellular force, we have to take into consideration what resistance it may meet, as in inflammation, tumefaction, granulation, ulceration, fungus or malignant growths, etc. When no great resistance is in the way, as in recent wounds and inflammations, its recuperative effects are readily manifested, but where they do exist they must be removed if possible to gain any advantage. For example: in recent ophthalmia a mild sedative alternative collyrium may give relief in a day or two; that is the collyrium holds the irritation and congestion at bay, whilst the cellular radiation is effecting a cure by resolution; but let the ophthalmia be of a chronic nature with obstinate painful granulations, although the cellular force is not withheld, but rather argued, no cure is effected, but in the struggle with the inflammation, causes tumefaction of the lids, and adds to the granulation itself. Now what is indicated is the heroic treatment to break up the granulations with the knife or caustic, to make way for a resolution on the system mentioned.

The *modus operandi* of cellular radiation on open wounds and parenchymatous inflammation are not the same. The former is an exudative process, and the

latter ends in a force of absorption. In our case of double pneumonia, the *limited continuous* irritant to the chest finally overcome the pulmonic irritation, which was the initiatory stage of inflammation, and at the time bringing a surplus of cellular force to the surface; the two adventitious forces in the lungs were now properly balanced, and resolution at once ensued.

It is not the case, as is generally supposed, that an external irritant alone will compensate for an internal congestion. Congestion before it causes organic changes, if overcome by proper means, disperses with wonderful rapidity.

The contractility of the connective cells toward the seat of the wound, has forcibly revealed itself in the following case:

4. In 1860 a teamster in a state of intoxication fell from his wagon, that was heavily loaded with brick. One of the wheels passed over his head, tearing away the integuments from the left side of the head, leaving a flap lying over the left upper side of the face. It appeared as if a large portion of the pericranium was shaved away with the flesh. I carefully cleansed the wound, and brought the flap to its place as well as I could, mainly with sutures. An inflammatory action set in, and tore out every suture I had made. I replaced them repeatedly, but noticed that the resistance of the flap became less every day as the inflammation lessened, and finally ceased entirely, and a *reverse action* set in in the closing up of the wound.

The healing of a wound is more promoted by cellular radiation than by local inflammation. A healthy local inflammation is a necessity, but mainly to resist the absorption of septic matter from the wound. This resistance is simply a blocking up of the surrounding tissues of the wound, in which cellular radiation likewise is an important factor to effect this, but is characterized by the power of exudation instead of absorption. In my "Medical Consultation Book," I paid special attention in pointing out the effects of the albuminoids in protecting the system from the internal encroachment of toxic matter. The subject is one of great interest, and now to add another order of protection in the healing process of wounds, makes the study of self-protection in the animal economy a most interesting subject to the surgeon and the physician.



